

A REVISION OF THE GENUS *ASTEROCOCCUS* BORCHSENIUS
(HOMOPTERA: CEROCOCCIDAE)

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Abstract.—A new species of scale insect from India, *Asterococcus ramakrishnai*, is described and illustrated. *Asterococcus pyri* Borchsenius is considered a synonym of *A. muratae* (Kuwana), and redescrptions are provided for *A. ovoides* (Cockerell) and *A. muratae*. A discussion on the generic status of *Asterococcus* and a key for separation of adult females are included.

Borchsenius (1960) proposed the genus *Asterococcus* to include four new species of scale insects (*A. pyri*, *A. quercicola*, *A. schimae*, *A. yunnanensis*) he described from collections made in China and Russia. These species differed significantly from other species of Cerococcinae in adult morphology and test development. Also, he indicated that *Cerococcus muratae* (Kuwana) should be included in the new genus. In a revision of *Cerococcus* by Lambdin and Kosztarab (1977), *C. ovoides* (Cockerell) and *C. muratae* (Kuwana) were transferred to *Asterococcus*. Recently, Wang (1980) provided a brief review of *Asterococcus*, and described a new species, *A. atratus*, from China. The adult females are distinguished from species of related genera by a wide band of pores and ducts extending around the ventral margin of the body. The sacklike test is characterized by the first instar exuvia being retained in the middorsal region, and a tubular projection arising at the base of the test is directed upward.

Reported here are redescrptions for *A. muratae* and *A. ovoides*, description of a new species from India, and key to species of *Asterococcus*. Measurements of morphological characters are given in micrometers; averages are followed by ranges in parentheses. Numbers of specimens studied are presented followed by the slide number in parentheses. Depositories of type-material are abbreviated: BMNH, British Museum (Natural History), London; FAHU, Faculty of Agriculture, Hokkaido University, Sapporo, Japan; FDACU, Florida Department of Agriculture and Consumer Services, Gainesville, Florida; USNM, National Museum of Natural History, Beltsville, Maryland; UT, University of Tennessee, Knoxville; VPISU, Virginia Polytechnic Institute and State University, Blacksburg.

Asterococcus Borchsenius, 1960

Type-species.—*A. schimae* Borchsenius.

Generic diagnosis.—Tests of adult females: globose to dome shaped, first instar exuviae retained on anteromedial area, spiracular furrows lined with white pow-

dery wax, and a slightly curved tubular extension arising at posterior base and projecting dorsad for elimination of excrement.

Adult female.—Body pyriform with well-developed anal lobes and anal cleft, anal ring with 8 fleshy setae, anal shield, bifid posterior spiracular furrows (except *A. ovoides*), bilocular pores, pair of postvulvar setae at apex of anal cleft, simple pores irregularly spaced, tubular ducts most numerous on margin, unsegmented antenna and leg stubs, 3-segmented labium with 8–12 setae, 5 or 7-locular pores dominant at antennal base and spiracular furrows, 8-shaped pores on dorsal and ventral surfaces. Largest 8-shaped pores in marginal band primarily on venter, and in 1–3 transverse bands on dorsal abdominal segments; smallest 8-shaped pores in transverse rows on ventral abdominal segments, but present or absent on dorsal cephalothoracic and anterior abdominal segments.

Remarks.—Body shape, pores, ducts and setal types are similar for species of *Asterococcus*, *Cerococcus*, and *Solenophora*. The primary characteristics used to differentiate species of the three taxa include size and dorsal arrangement of 8-shaped pores, number of anal ring setae, and tests of adult females. Species of *Cerococcus* have 8-shaped pores in clusters, lattice pattern or evenly spaced on dorsum, 8 anal ring setae, and test without middorsal first instar exuvia or well-developed anal tube. Species of *Solenophora* have dorsal 8-shaped pores restricted to a transverse band on posterior abdominal segments, 6 anal ring setae, and test with first instar exuvia retained middorsally and well-developed anal tube projecting downward. A key to separate *Asterococcus* from related genera was presented by Lambdin and Kosztarab (1976, 1977).

Asterococcus muratae (Kuwana)

Fig. 1

Cerococcus muratae Kuwana, 1907: 180, 1917: 5; Sasser, 1913: 109; Green, 1919: 270; Sakai, 1935: 298; Borchsenius, 1937: 172, 1950: 131; Tachikawa, 1955: 52; Takahashi, 1956: 4; Tamaki, 1969: 86.

Solenococcus muratae Sanders, 1909: 36; Howard, 1921: 132.

Solenophora muratae: Cockerell, 1909: 55.

Asterococcus muratae: Borchsenius, 1960: 128; Lambdin and Kosztarab, 1977: 1; Paik, 1978: 277; Kawai, 1980: 173.

Asterococcus pyri Borchsenius, 1960: 118. **NEW SYNONYMY.**

Type-locality.—Tokyo, Japan.

Type-material.—Paratypes: on *Vitis vinifera* L. (Vitaceae), 2(1), Tokyo, Japan, 16 Apr. 1906, S. I. Kuwana coll. no. 6 (USNM). Because the "type" specimen was referred to specifically by Kuwana (1907) as having been deposited in the entomological collection of the Imperial Agricultural Experiment Station (Yokohama, Japan), it is considered the holotype, and the 2 specimens from the type-series are designated paratypes in this study.

Additional material studied.—On *Ilex oldhami* (Aquifoliaceae), 5(1), Korasan, Chikugo, Japan, S. Miyamoto coll., Apr. 1935 (FAHU); *Ficus* sp. (Moraceae), 27(16), Nagasaki, Japan, G. Compere coll. (VPISU no. PL 127 a–g, 172 a–i); *Machilus* sp. (Lauraceae), 1(1), Mt. Takas, Japan, R. Takahashi coll., 16 Jul. 1950 (FAHU); *Viburnum odoratissimum* (Caprifoliaceae), 17(2), Yokohama, Japan, R. Takahashi coll., 26 Sept. 1952 (FAHU); with same data as former, 6(2), (BMNH) 1958, C.I.E. 13815-3021), and 2(1), (FDACU, ABH-402); on *Rosa* sp., 3(1),

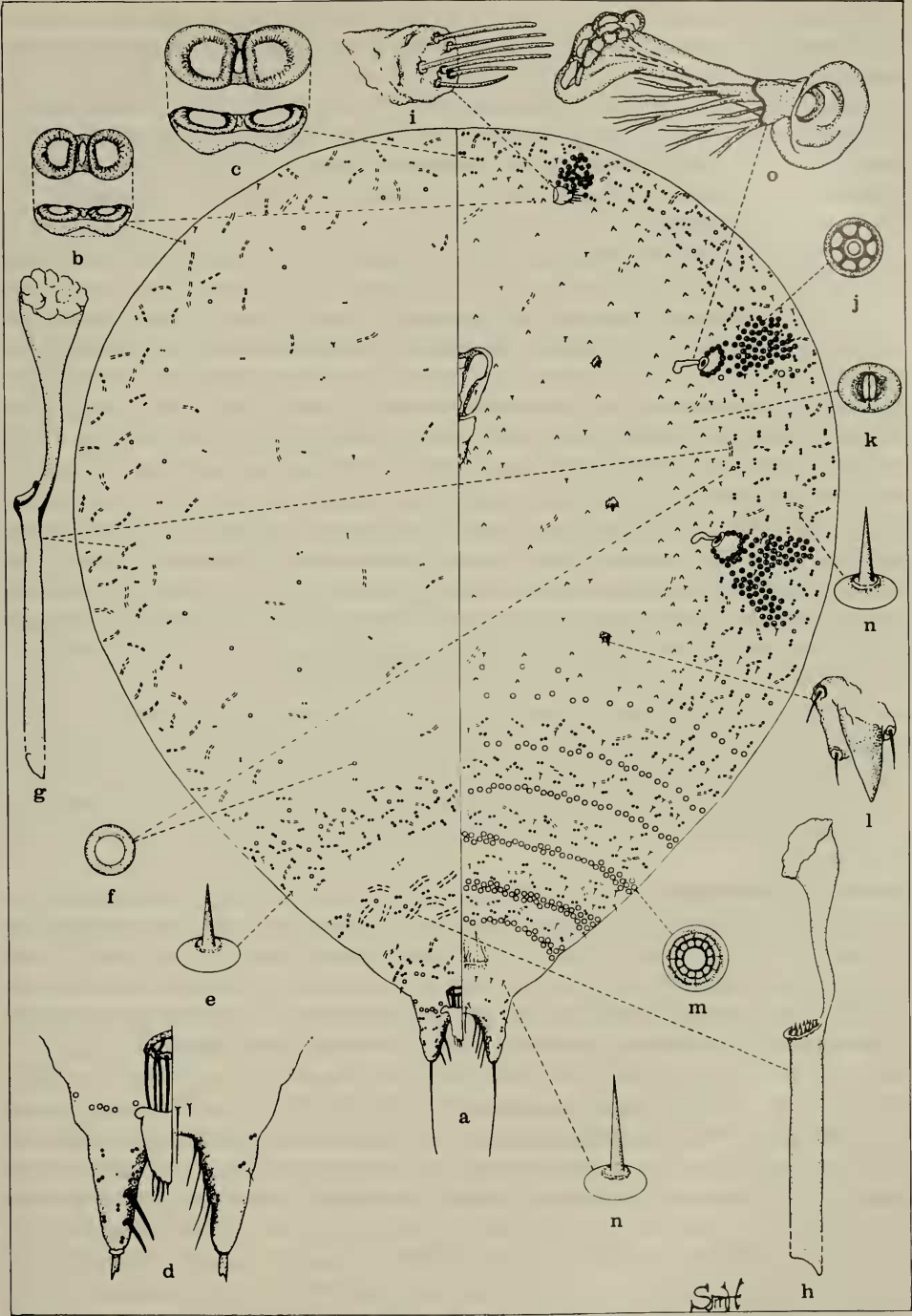


Fig. 1. *Asterococcus muratae*, dorsoventral view of adult female. See text for explanation.

Yokohama, Japan, G. Compere, coll. no. 326 (USNM). On undetermined hosts: 4(1), Nagasaki, Japan, G. Compere coll. no. 1281 (USNM); 3(1), Yokohama, Japan, G. Compere coll. no. 313 (USNM).

Female test (as described by Kuwana, 1907).—" . . . length 5 to 6 mm, width 4 to 5 mm, height about 3 mm, barnacle shaped, with several white bands which radiate from the cone; mounted with reddish brown exuviae. Subtransparent, brownish red in color. Posterior end of the test with a tube-like projection."

Male test.—Not seen.

Body of adult female (Fig. 1a).—Pear-shaped, 5000 (3264–6414) long, 2435 (1856–3207) wide. Derm membranous with several pore types, ducts and setae.

Dorsum.—8-shaped pores unevenly spaced, 2 sizes present. Smaller pores (Fig. 1b) on cephalothorax and anterior abdominal segments; each 6 (5–6) long, 4 (3–5) wide. Larger pores (Fig. 1c) arranged in 3 transverse bands on posterior abdominal segments above anal lobes; each 8 (6–9) long, 5 (4–5) wide. Anal lobes (Fig. 1d) triangular, heavily sclerotized on inner margin. Each lobe with an apical seta 185 (168–191) long and 2 posterolateral fleshy setae; anterior 37 (29–46) long, posterior 30 (22–41) long. Anal ring (Fig. 1d) located anterior to anal shield, 60 (51–68) long, 48 (40–54) wide; with 8 fleshy setae, each 127 (110–141) long; setae bordered by inner and outer row of evenly spaced translucent pores. Anal shield (Fig. 1d) triangular, often serrated at apex, 78 (54–86) long, 88 (54–98) wide. Cribriform plates absent. A few tacklike setae (Fig. 1e) spaced throughout derm in segmental rows, each 4 (3–6) long. Simple disc pores (Fig. 1f) distributed throughout derm, most numerous above anal lobes, each 2 (2–3) in diam. Tubular ducts (Fig. 1g, h) distributed throughout derm, most numerous on margin, 2 types present, both types with cylindrical base and clavate terminal filament. The dominant type (Fig. 1g) with sclerotized cup without conical spines, 42 (37–54) long, 2 (2) wide; other ducts (Fig. 1h) positioned anterior to anal plate and anal ring in a transverse band, cup heavily sclerotized with spines, each 33 (22–48) long, 4 (3–4) wide.

Venter.—Two sizes of 8-shaped pores (Fig. 1b, c) present on cephalothorax, restricted to marginal-submarginal band 6–9 pores wide. Larger pores in band 6–8 pores wide, each 9 (8–10) long, 5 (5) wide; smaller pores in an irregular row mesad of larger pores, each 7 (6–7) long, 4 (4–5) wide. 8-shaped pores (Fig. 1c) on abdomen arranged in 5 transverse bands, each band 1–3 pores wide; each pore 8 (6–8) long, 4 (4–5) wide. Antenna (Fig. 1i) reduced, unsegmented, 31 (24–39) long, 26 (21–30) wide; with 5–7 fleshy setae; an associated pore band extending laterad from antennal base composed of 26 (17–29) 5 to 10-locular pores, 7-locular pores (Fig. 1j) dominant, each 5 (4–6) in diam. Bilocular pores (Fig. 1k) most numerous in submarginal region, pores restricted to cephalothorax and anterior 1–2 abdominal segments; each 5 (5–6) long, 4 (4–5) wide. Clypeolabral shield 204 (173–249) long, 154 (136–193) wide; with an apical pair of setae ca. 10 long (2 pairs on specimens collected from *Viburnum* sp. and *Vitis* sp.), and usually a medial pair ca. 6 long. Labium triangular, 96 (82–113) long, 89 (74–103) wide; with 5 (5–6) pairs of slender setae on apical and medial segments, 16 (10–30) long; and 1 (0–1) pair on basal sclerite, 4 (2–5) long. Legs (Fig. 1l) reduced to unsegmented stubs, 14 (10–18) long. Microspines most numerous in medial and submedial areas of posterior abdominal segments and leg base. Multilocular pores

(Fig. 1m) primarily 10-locular, arranged in 7 (rarely 8) transverse abdominal rows, each 5 (5–6) in diam. Needle-like setae (Fig. 1n) on cephalothorax and in transverse abdominal rows between 8-shaped pore row, each 7 (4–9) long; a fleshy pair of suranal setae at apex of anal cleft 77 (68–99) long, and an associated pair anterior to latter 13 (8–20) long; anal lobes with 4 slender spinelike setae on inner margin 40 (24–51) long, and 1–2 smaller setae on outer margin 9 (5–15) long. Simple disc pores (Fig. 1f) sparse, shape and size same as those on dorsum. Spiracles (Fig. 1o) on submargin, 78 (63–97) long, 39 (33–49) wide, atrial orifice 18 (14–23) in diam. Spiracular furrows with a band of 7 (5–10)-locular pores 2–6 pores wide. Each anterior furrow with 72 (54–91) pores. Posterior furrows bifid, each furrow with 92 (82–104) pores. Spiracular setae absent, occasionally a seta associated with each spiracular pore cluster. Tubular ducts (Fig. 1g) most numerous in marginal area, shape and size same as those on dorsum.

Affinities.—My observations concur with those by Borchsenius (1960) indicating *A. muratae* to be most closely related to *A. schimae*. Characteristics shared by the two species include 3 pairs of unsegmented leg stubs, 4 setae on inner margin of each anal lobe, 7 transverse abdominal rows of multilocular pores, cluster of 16–29 pores at base of each antenna, and absence of cribiform plates. *Asterococcus muratae* differs from *A. schimae* by the presence of dorsal 8-shaped pores in transverse rows on cephalothorax, more numerous 7-locular pores in spiracular furrows, and absence of trilocular pores in spiracular furrows.

***Asterococcus ovoides* (Cockerell)**

Fig. 2

Pollinia ovoides Cockerell, 1901: 225.

Cerococcus ovoides: Green, 1909: 340; Ferris, 1918: 332; Brain, 1920: 119; Hall, 1935: 219; Munro and Fouche, 1936: 34; Ayyar Ramakrishna, 1936: 145.

Asterococcus ovoides: Lambdin and Kosztarab, 1977: 1.

Type-locality.—Durban, South Africa.

Type-material.—From the syntypes, an adult female on 1 slide is here designated as **lectotype**, and the remaining 3(3) specimens as paralectotypes. All on unknown host, Natal, S. Africa coll. Fuller (USNM).

Additional material studied.—On *Ficus* sp., 1(1), Pietermaritzburg, Natal, S. Africa, 1911, coll. A. Kelley (Brain coll. no. 26) (USNM); 2(1), no data, (USNM).

Female test.—Sacklike, globose, 1.0–1.7 mm long, yellowish brown in color with 1st instar exuvia positioned on middorsal area of test. A pair of white waxy bands visible on each side extending from exuvia to base of test.

Male test.—Elliptical, 1.0–1.4 mm long, 0.4–0.6 yellowish brown in color. Minute median carina composed of 5–6 series of waxy tubercles, and with 5–6 corresponding transverse ridges on anterior $\frac{2}{3}$ of test. Anal flap with minute transverse ridges.

Body of adult female (Fig. 2a).—Pyriform, 1273 (1052–1643) long, 1098 (753–1237) wide.

Dorsum.—8-shaped pores widely spaced throughout derm, 2 sizes present. Smaller pores (Fig. 2b) in transverse rows on cephalothorax and anterior abdominal segments; each 6 (5–7) long, 3 (3–4) wide. Larger pores (Fig. 2c) in transverse band 2–3 pores wide on 7th abdominal segment, each 7 (6–8) long, 4 (4–5) wide.

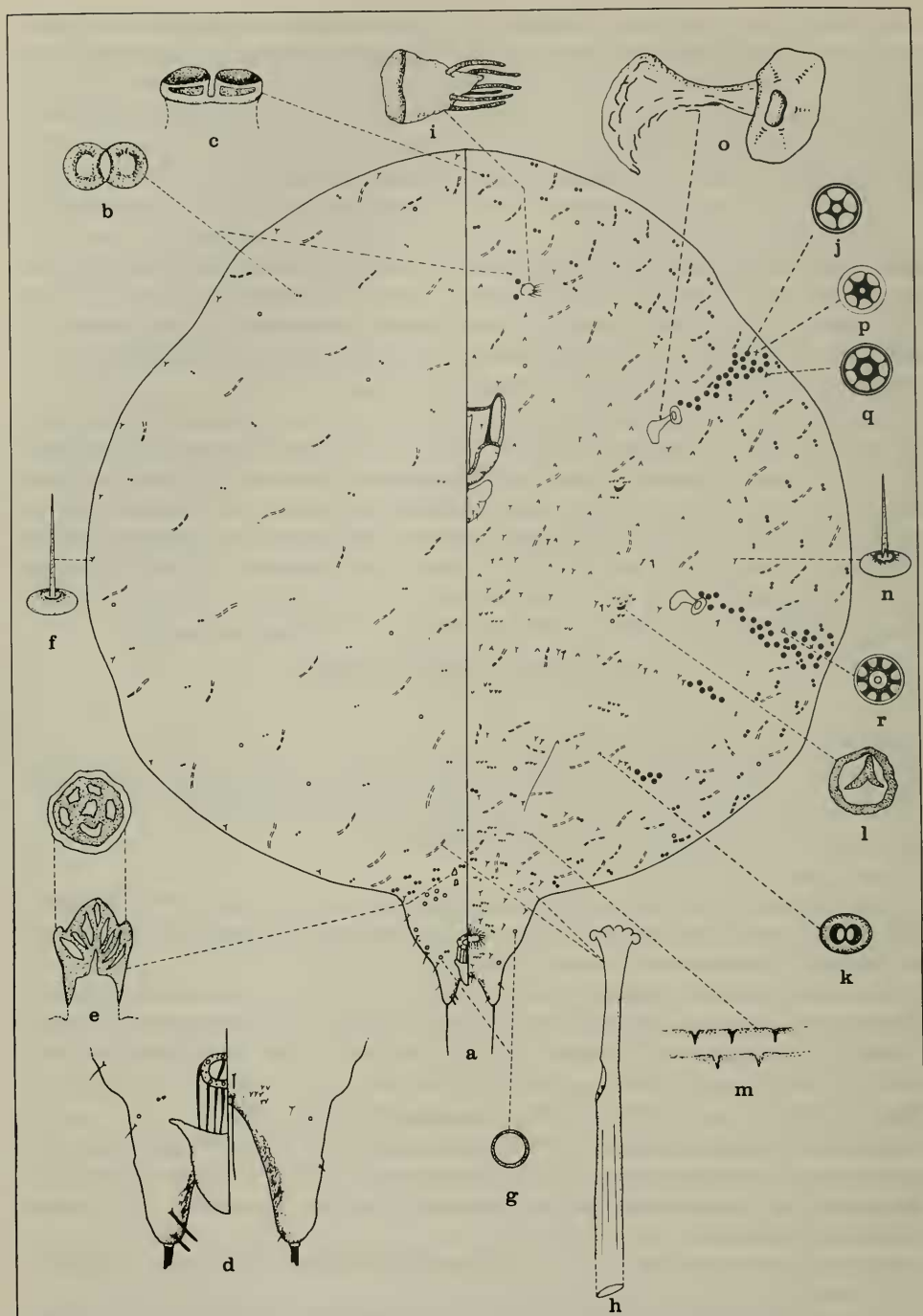


Fig. 2. *Asterococcus ovoides*, dorsoventral view of adult female. See text for explanation.

Anal lobes (Fig. 2d) triangular, lightly sclerotized on inner margin; each lobe with apical seta 118 (101–128) long, and 2 posterolateral fleshy setae, anterior 17 (11–27) long, posterior 10 (9–12) long. Anal ring (Fig. 2a, d) 22 (12–25) long, 19 (18–21) wide; with 8 fleshy setae, each 42 (39–59) long; setae bordered by inner and outer row of pores. Anal shield (Fig. 2d) triangular, 28 (20–34) long, 28 (22–42) wide. Cribriform plates (Fig. 2e) arranged in 2 submedial groups with 2–3 plates per group, plates elevated on derm; each subcircular, unevenly areolated and 11 (9–14) in diam. Dorsal body setae rare, a few slender setae (Fig. 2f) segmentally arranged on margin, each 6 (4–10) long. Simple disc pores (Fig. 2g) distributed throughout derm, most numerous in anal area, each 3 (2–4) in diam. Tubular ducts (Fig. 2h) irregularly spaced throughout derm, each 35 (29–41) long, 2 (2) wide; each duct with a clavate terminal filament and sclerotized cup with 0–2 minute conical spines.

Venter.—Three sizes of 8-shaped pores present. Largest pores (Fig. 2c) in marginal-submarginal band 3–5 pores wide; each 9 (8–11) long, 5 (4–6) wide. Smallest pores (Fig. 2b) in submarginal band 1–2 pores wide mesad of larger 8-shaped pore band; each 6 (5–8) long, 3 (3) wide; a few slightly larger pores scattered in spiracular furrows and in 2 transverse abdominal rows anterior to vulva, each 8 (7–9) long, 5 (4–5) wide. Antenna (Fig. 2i) reduced, unsegmented, 20 (17–25) long, 20 (14–25) wide; each with 6 fleshy setae, and 1–3 associated quinquelocular pores (Fig. 2j) located at base. Bilocular pores (Fig. 2k) in cephalothoracic area and in 2 transverse rows on anterior abdominal segments; each 5 (4–5) long, 4 (3–5) wide. Clypeolabral shield 121 (111–130) long, 103 (86–116) wide, with 1 apical and 1 medial setae. Labium triangular, 65 (45–74) long, 60 (52–74) wide; with 4 pairs of setae, each 13 (6–20) long. Legs absent or reduced to occasional meso- and metathoracic stubs (Fig. 2l), each 3 (1–7) long. Microspines (Fig. 2m) in medial area of abdominal segments and around leg stubs. Multilocular pores absent. Needle-like setae (Fig. 2n) in segmental rows on cephalothorax and abdomen, each 6 (4–11) long; a pair of spinelike suranal setae at apex of anal cleft 47 (41–54) long, and an associated pair of hairlike setae anterior to suranal setae 7 (6–10) long. Each anal lobe with 2 needle-like setae on inner margin and one on outer margin. Simple disc pores (Fig. 2g) sparsely scattered, most common on margin of posterior abdominal segments. Spiracles (Fig. 2o) on submargin, 45 (39–50) long, 23 (21–25) wide, atrial orifice 7 (6–10) in diam. Anterior spiracular furrow with band of 66 (59–81) pores, primarily 5-locular (Fig. 2j); a few (1–3) 6-locular (Fig. 2p), 7-locular (Fig. 2q), and multilocular (Fig. 2r); posterior furrows not bifid, with 63 (58–70) pores. Other 5-locular pores in 4 groups of 5–9 pores each, groups on submargin of anterior 2 abdominal segments. Tubular ducts (Fig. 2h) most numerous in marginal-submarginal area, sparsely scattered throughout remainder of derm, shape and size same as on dorsum.

Affinities.—Adult females of *A. ovoides* are morphologically similar to other species included in the genus. A close relationship to *A. quercicola* is indicated by the reduced number of pores at base of each antenna, absence of multilocular pores on venter, the presence of 4–6 cribriform plates and 4 pairs of labial setae. However, *A. ovoides* differs from *A. quercicola* by having 2, rather than 3, setae on inner margin of anal lobes, non-bifid posterior spiracular furrows, and 8-shaped pores in transverse rows on dorsum of cephalothorax.

Asterococcus ramakrishnai Lambdin, NEW SPECIES

Fig. 3

Type-locality.—Bombay, Coimbatore, Madras, India.

Type-material.—On Banyan tree (*Ficus* sp., Moraceae), holotype ♀ (1) and 16 paratypes (4), Bombay, India, G. Compere coll. no. 276, 1384, 1385 (USNM). On *Ficus* sp., 2(1), Rhamba nr. Lake Chilka, Madras, India, 5 Mar 1910, Ind. coll. no. 76 (VPISU). On *Ficus religiosa* L., 1(1), Coimbatore, India, 24 May 1931, coll. T. V. Ramakrishna (UT).

Body of adult female (Fig. 3a).—Pyriform, 3233 (1852–5067) long, 3018 (1514–4600) wide.

Dorsum.—Large 8-shaped pores (Fig. 3b) in transverse band on 7th abdominal segment; each 9 (6–11) long, 5 (5–6) wide. Smaller 8-shaped pores (Fig. 3c) on anal lobes and in 2 transverse segmental rows above anal ring; each 7 (7–8) long, 4 (4–5) wide. Anal lobes (Fig. 3d) triangular, heavily sclerotized on inner margin; each lobe with apical seta 122 (114–134) long, and 2 fleshy posterolateral setae 23 (23–36) long. Anal ring located anterior to anal shield; 57 (45–72) long, 51 (40–57) wide; with 8 fleshy setae, each 100 (86–134) long; setae bordered by inner and outer row of pores. Anal shield (Fig. 3d) triangular, serrated at apex, 72 (55–87) long, 91 (76–114) wide. Cribriform plates absent. Setae sparse, tacklike, most numerous on 8th abdominal segment, irregularly spaced in segmental rows, each 12 (9–18) long. Simple disc pores (Fig. 3e) irregularly spaced throughout derm, most numerous on posterior abdominal segments anterior to anal lobes, each 3 (2–4) in diam. Tubular ducts (Fig. 3f) irregularly spaced, most numerous on margin, one type present without teeth in sclerotized cup; each 32 (18–42) long, 2 (1–2) wide.

Venter.—Two sizes of 8-shaped pores (Fig. 3b, c) present. Larger pores in marginal-submarginal band 8–10 pores wide, each 9 (6–11) long, 5 (5–6) wide. Smaller pores in irregular row on cephalothorax between large 8-shaped pore band and bilocular pores, and in 3 transverse rows on posterior abdominal segments; each 7 (6–8) long, 5 (4–6) wide. Antenna (Fig. 3g) reduced, unsegmented, 21 (17–30) long, 27 (14–39) wide at base; with 5 fleshy setae, each 28 (18–36) long; 28 (18–33) 5- to 8-locular pores in band at base of antenna, 7-locular pores (Fig. 3h) dominant, each 4 (2–7) in diam. Bilocular pores (Fig. 3i) most numerous around mouthparts and on submargin of cephalothorax and anterior abdominal segments; each 5 (4–6) long, 4 (2–5) wide. Clypeolabral shield 213 (196–244) long, 169 (156–186) wide; with 3 (2–3) pairs of setae, each 11 (5–16) long. Labium triangular, 115 (100–128) long, 91 (81–121) wide; 6 (5–6) pairs of setae, each 23 (18–28) long. Legs absent, 2 specimens with unsegmented stubs (Fig. 3j) ca. 15 long on metathorax. Multilocular pores (Fig. 3k) in 3 transverse rows on posterior abdominal segments; each with double central apertures, each 12 (12–13) in diam. Needle-like setae (Fig. 3l) in segmental rows on cephalothorax and abdomen, each 11 (8–14) long; a few smaller setae in area around mouthparts and antennae 8 (6–10) long; a fleshy pair of suranal setae at apex of anal cleft 60 (50–67) long, and an associated pair anterior to suranal setae 17 (12–23) long. Anal lobes with 6 pairs of spinelike setae on inner margin, each 30 (19–40) long, and a medial setae 14 (10–16) long. Simple disc pores (Fig. 3m) restricted to marginal-submarginal area of cephalothorax and posterior abdominal segments, each 3 (2–3)

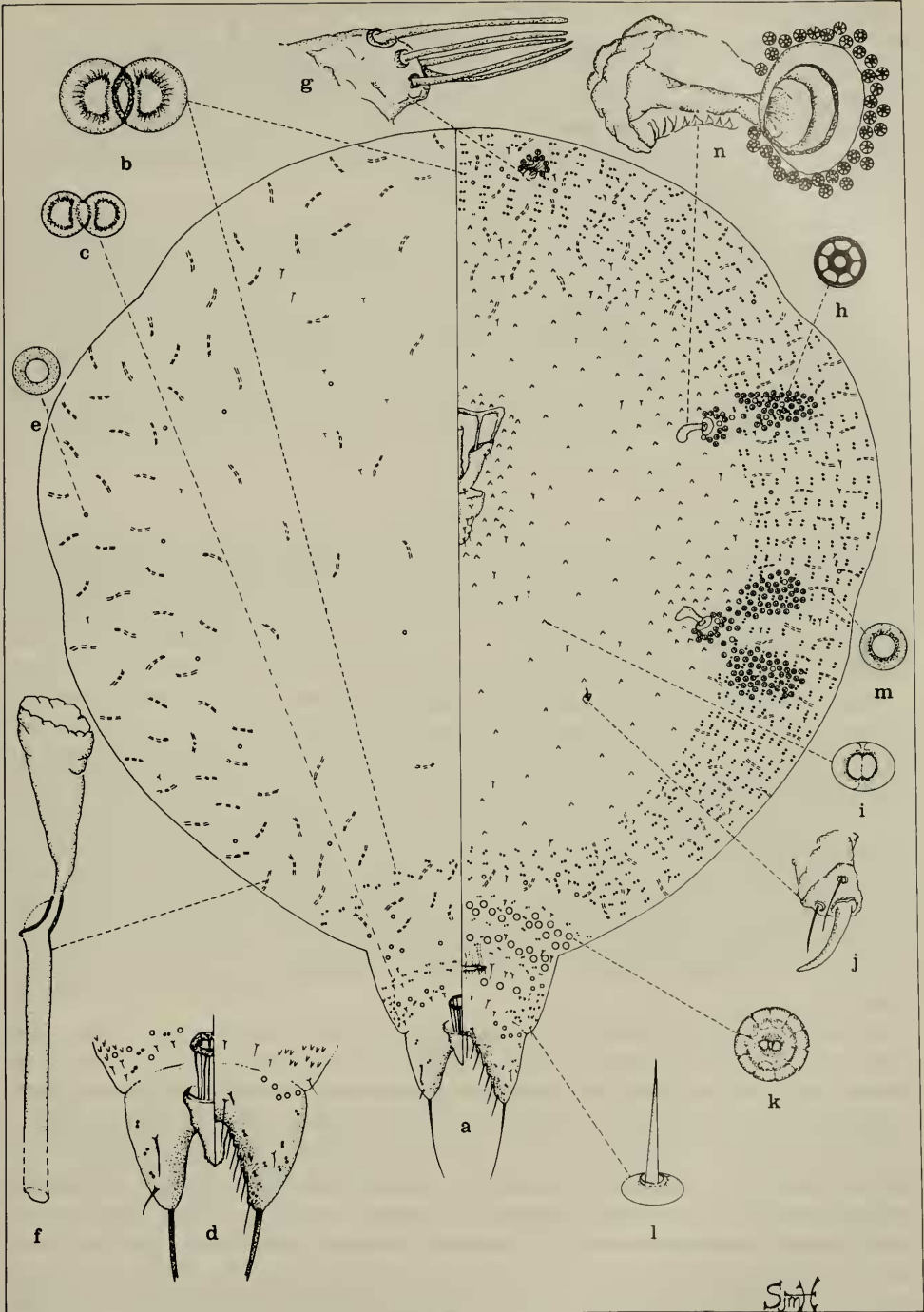


Fig. 3. *Asterococcus ramakrishnai*, dorsoventral view of adult female. See text for explanation.

in diam. Spiracles (Fig. 3n) on submargin, 68 (57–85) long, 39 (22–47) wide, atrial orifice 19 (18–20) in diam. Anterior spiracular furrows with a band of 172 (146–206) 5- to 8-locular pores; posterior furrows bifid, with 210 (122–288) pores; 7-locular pores (Fig. 3h) dominant. Tubular ducts (Fig. 3f) most numerous in marginal-submarginal area, shape and size similar to those on dorsum.

Etymology.—The species epithet is derived from T. V. Ayyar Ramakrishna, a pioneer investigator on scale insects of India.

Affinities.—Adult females of *A. ramakrishnai* are similar to those of *A. muratae*, *A. schimae*, and *A. yunnanensis* in regard to body shape, type and distribution of pores and ducts, and number of labial setae. Characters that distinguish *A. ramakrishnai* from related species include transverse rows of multilocular pores on the ventral abdominal segments reduced to 3, rather than 7 or 8, each multilocular pore with double central apertures opposed to a central aperture in pores on other species, a wider 8-shaped pore band on margin, and each anal lobe with 6 needle-like setae on inner margin compared with 2 to 4 on other species in the genus.

DISCUSSION

Species of *Asterococcus* are represented in the Ethiopian, Oriental, and Palearctic regions. Tests of adult females are similar to that of *Solenophora*; however, adult females are morphologically similar to species of *Cerococcus*. Similar structures of major significance found in species of the three genera include: size of the 3-segmented labium, 8-shaped pores, bilocular pores, cribriform plates (often present), curved anal shield, pair of suranal setae at apex of anal cleft, spiracular furrows lined with pores (posterior furrows often bifid), tubular ducts with filament, well-developed anal lobes, and anal ring with setae. Characters that differentiate the monotypic genus *Solenophora* from species of *Asterococcus* and *Cerococcus* are: an anal ring with 6 (rather than 8) setae, lack of 5- to 10-locular pores at base of antennae, and simple pores prominent in marginal band of pores and ducts. Species of *Asterococcus* are easily distinguished from those of *Cerococcus* by the wide band of pores and ducts extending around the ventral margin of the body. The presence or absence and arrangement of pores, ducts, and setae, rather than type variation of these structures, often differentiate species of *Asterococcus* from *Cerococcus*.

Borchsenius (1960) stated that *A. pyri* and *A. quercicola* possessed 6 anal ring setae, but paratypes examined have 8 setae. He described *A. pyri* from host material collected in Sukham, Russia, but noted that the species was on plants probably imported from Japan. Major differences observed in *A. pyri* examined from his description include: 7-locular rather than 8-locular pores dominant in spiracular furrows and base of antennae, 4 setae rather than 3 on inner margin of each anal lobe, and 8 rather than 6–8 fleshy setae on anal ring. Borchsenius (1960) noted that specimens of *A. muratae* were not available to him for comparison; thus, he was unaware of various characteristics possessed by *A. muratae* that he attributed to *A. pyri* (e.g. occurrence of leg stubs in *A. muratae*). Because no distinguishable differences exist in the number, type or arrangement of any morphological structure, *A. pyri* Borchsenius is considered a synonym of *A. muratae* (Kuwana).

KEY TO SPECIES OF *ASTEROCOCCUS*

- 1. Cribriform plates present; 10 or less disc pores at antennal base; multilocular pores absent from abdomen 2
- Cribriform plates absent; 11 or more disc pores at antennal base; multilocular pores present on abdomen 3
- 2. Leg stubs absent; posterior spiracular furrows bifid; from oak trees in China *quercicola* Borchsenius
- Leg stubs on meso- and metathorax; posterior spiracular furrows not bifid; from fig trees in South Africa *ovoides* (Cockerell)
- 3. Multilocular pores in 7 or 8 transverse rows; 4 needle-like setae on inner margin of each anal lobe; from areas other than India 4
- Multilocular pores in 3 transverse rows; 6 needle-like setae on inner margin of each anal lobe; known only from India *ramakrishnai*, new species
- 4. Dorsal 8-shaped pores in transverse rows on cephalothorax; anterior 8-shaped pore band on abdomen 5–8 pores wide 5
- Dorsal 8-shaped pores absent on cephalothorax; anterior 8-shaped pore band on abdomen 2–3 pores wide *schimae* Borchsenius
- 5. Trilocular pores present in spiracular furrows; basal labial sclerite without setae; multilocular pores in 8 transverse rows *yunnanensis* Borchsenius
- Trilocular pores absent from spiracular furrows; basal labial sclerite usually with 1 pair of setae; multilocular pores in 7 transverse rows *muratae* (Kuwana)

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